

its construction would involve a very great expenditure, and occupy a long time; and it is very unfortunate that the fact of Lake Tsana, near the headwaters of the Blue Nile, being in Abyssinia is considered as precluding its utilisation as a storage reservoir for the irrigation of the Sudan and Egypt, with its great natural advantages of extensive area and commanding position. Several sections of reservoir dams are given in a chapter on dams and reservoirs, which, being drawn to various scales, are not readily compared, though forming an interesting series; but the foundations of the new Croton dam have had to be carried down more than forty feet deeper than shown on the section; and the Salt River dam, constructed for the irrigation of an arid district in Arizona, only about seventeen feet less in maximum height than the Croton dam, has the crest of its waste weirs raised the unprecedented height of 225 feet above the deepest part of the river-bed at the dam.

Interesting descriptions are given of the diversion weirs across rivers in India to raise their water-level for supplying inundation canals, and of the Zifta, Delta, and Assiout barrages for regulating the supply of irrigation water from the Nile, worked by Stoney's sluice-gates sliding on free rollers. The important function, however, performed by the Assiout barrage in raising the water-level of the river in August, 1902, during so low a flood of the Nile that the water could not flow into the great canals, until, by the prompt action of Mr. Webb in closing the gates, a sufficient head was obtained, for which the barrage had not been designed, should not be overlooked, as it preserved a large tract from a loss in non-irrigated crops of more than 600,000*l*. Moreover, the Esna barrage, in course of construction across the Nile between Assuan and Assiout, has been designed of sufficient strength to perform a similar duty when needed in perfect safety. Standard books, indeed, have been previously issued dealing with irrigation works on their grandest scale, in "The Irrigation Works of India," by Mr. Buckley, and "Egyptian Irrigation," by Sir William Willcocks; but the book under review will be very valuable for all persons interested in irrigation, by dealing in a single volume with and contrasting the principal works and systems of irrigation in these two great countries, and thus presenting a very comprehensive view of that most important subject of irrigation for the development of arid regions.

GEOLOGICAL EXPLORATIONS IN SINAI.

The Topography and Geology of the Peninsula of Sinai (South-eastern Portion). By W. F. Hume. Pp. 280+plates. (Cairo: National Printing Department, 1906.)

THE interesting region described in this memoir by the Superintendent of the Geological Survey of Egypt extends from near Dahab along the western borders of the Gulf of Akaba to the promontory of Ras Mohammed. It lies east of Mount Sinai proper, or Gebel Musa, which is not, however, the highest of the Sinai mountains.

Attractive as the region is from an historical point of view, and interesting as it is to the naturalist, it offers

few temptations for the ordinary tourist; and this not merely because it is an arid country. The Arab inhabitants are honest and obliging, but their dwellings consist simply of cloth stretched on a few poles, and placed under the protection of a rocky ridge. Keen as sportsmen, they use flint-lock guns, often of great length, serviceable for small game, as well as for the leopard, hyæna and ibex, which are the more abundant of the larger mammals. The country itself has been spoken of as "one of the most mountainous and intricate regions on the face of the earth," and Dr. Hume admits that much of it is a veritable wilderness with a bewildering complex of topographical structure. To the mountaineer it will hardly appeal, as there are no inaccessible peaks, but to the botanist and zoologist, who will find chapters specially devoted to them, and to the geologist, there are many attractions, not the least of which may be the absence of any extensive literature on their subjects.

The main portions of the area are composed of igneous and metamorphic rocks of ancient date—pre-Carboniferous at any rate. They rise in a mountain system trending north-east and south-west with a transverse chain that parts the region into two districts. The rocks include gneiss and sundry schists, granites, andesites, felsites, &c. The earliest sedimentary and volcanic rocks were penetrated by masses of granite, and some of the later intrusions have been arranged in strikingly symmetrical lines. The northern portion of this region is largely plateau, an old plain of marine denudation that appears only recently to have lost its capping of Nubian Sandstone. It has an average level of 1220 metres, except where cut by narrow gorges. In the southern portion, which comprises a multitude of ranges and peaks, the valleys are more deeply excavated, and in consequence the mountains, though lower, appear relatively higher than those in the north.

Still further north there is an area composed of barren Nubian Sandstone with overlying fossiliferous limestones of Cenomanian age, where the succession is greatly disturbed by trough-faults that have led to the production of rift valleys.

The structure, in a broad sense, is comparatively simple, as Dr. Hume observes, the main features having been produced by upheaval and dislocation rather than by erosion. Thus the principal mountain chain is due to a fault with a westerly downthrow of more than 5000 metres. Nevertheless, the influence of the rocks on the configuration of the land is well marked. The summits of many peaks are formed by felsite dykes; elsewhere parallel dykes of felsite and dolerite form the remarkable "dyke country," while the granite, which wears away in shells, presents curious rounded knobs and pillars. The coastal plain exhibits many features of interest in the presence of Miocene strata, and also of raised coral-reefs of Pleistocene age. Moreover, there are terraces of roughly stratified gravel in the principal valleys, as well as countless loose boulders. These were probably of torrential origin, distributed during the Glacial period, when, as Dr. Hume remarks, a small amount of *névé* might have accumulated on the Sinai mountains. Of still later date are some curious calcareous sandstones

that contain oolitic grains, and are perhaps of marine origin. No economic products of great importance are known, though ores of copper, iron, and manganese have been found, and it is suggested that gold should be sought for.

It only remains to add that the work is well printed and illustrated. If the geological maps are exceptionally ruddy in tint, this arises from the extent of igneous rocks. For the topographical details the author expresses his indebtedness to Mr. H. G. Skill, who contributes also an appendix on meteorology. The photographic views enable the reader to gain a good idea of the scenery and rock-features, as well as of a hyæna-den, of certain stone-circles, and of the Sinai convent.

H. B. W.

ELECTROCHEMISTRY.

A Text-book of Electro-chemistry. By M. Le Blanc; translated by W. R. Whitney and J. W. Brown. Pp. xiv+338. (London: Macmillan and Co., Ltd., 1907.) Price 10s. 6d. net.

THE new English edition of Le Blanc's "Electro-chemistry" has followed very closely upon the publication of the fourth German edition. One is at once struck by the great increase in size of the book and by the large increase in the number of diagrams. From the translators' preface we notice that twenty-five of the diagrams have been added by themselves, and the book has certainly been improved by the additions.

Although the scheme of the book is much the same as it originally was the additions are so numerous that it is almost a new work. By studying this edition and the first edition, which appeared in 1895, one is struck by the large amount of work which has been done in the domain of electrochemistry, albeit the fundamental laws have undergone very little change, the chief being one of degree rather than of principle. The ionic theory has been assailed from all sides, but although certain modifications have been made, such, for example, as the conception of the hydration of the ions, it must be conceded that it has rather gained strength than lost by the attacks. If those who assail the theory would give an alternative hypothesis which would as satisfactorily explain the phenomena of solution as does the ionic hypothesis, then the arguments would assume a more tangible form, and the ionic theory might be consigned to the limbo of history.

Prof. Le Blanc deals almost entirely with the theoretical aspects of electrochemistry, but at certain points he indicates the bearing of theory on practice. For example, on p. 18, when referring to the conversion of heat into electrical energy and of electrical energy into heat, a digression upon the "Electrical Furnace and its Industrial Importance" is made, the application of Ohm's law being given. Brief reference is here made to calcium carbide, cyanamide, carborundum, phosphorus, and the preparation of nitrates from atmospheric nitrogen, but the book, as already mentioned, does not deal with technical processes.

Chapter ii. deals with the development of electro-

chemistry up to the present time, and treats in the main with the development of the ionic theory.

More notice might have been taken of the difficult subject of the electrolysis of fused salts, the author having contented himself with a footnote on p. 316 referring the reader to Lorenz's "Die Elektrolyse geschmolzener Salze," and a remark that the phenomena are entirely analogous to those of aqueous solutions. The interesting phenomenon of electrolysis without electrodes is referred to on p. 317, and it is pointed out that in this case, as in electrolysis where both electrodes dip into the solution, Faraday's law is obeyed.

The translators, Drs. Whitney and Brown, have paid particular attention to nomenclature, and have endeavoured to be consistent throughout. The method adopted is set out in full in an appendix. The adoption of F instead of E for electromotive force is hardly happy; according to this rendering we get Ohm's law

$$C = \frac{F}{R}$$

F is more generally used to denote a Faraday, or 96,540 coulombs of electricity. The translators employ the symbol Q for quantity of electricity. These are, of course, minor points, but they are inclined to muddle the student. It would perhaps be a good thing to convene an international committee so that electrical and electrochemical nomenclature might be standardised; at present it must be admitted that it is more or less chaotic.

From a theoretical standpoint we do not think it possible to meet with a better book than the one before us, and there is little doubt that it will be highly appreciated and widely studied. F. M. P.

AUSTRALIAN INSECTS.

Australian Insects. By Walter W. Froggatt, Government Entomologist, New South Wales. Pp. xiv+449; with 37 plates, containing 270 figures, also 180 text-blocks. (Sydney: William Brooks and Co., Ltd., 1907.) Price 12s. 6d.

THIS is the first general introductory work published of the insects of Australia, and it will be very useful to residents commencing the study of entomology, as well as to any European or American entomologists who wish for a general view of the Australian insect fauna, which contains a large number of highly interesting forms not met with in other parts of the world, though some species found in the extreme north appear to be only an offshoot from the rich tropical fauna of New Guinea.

The classification adopted is mainly that employed by Dr. D. Sharp in the "Cambridge Natural History." Mr. Froggatt commences his work with an introduction, tables of contents, and chapters on classification, distribution, structure, and fossil insects; after a detailed account of the principal groups of insects represented in Australia, including much interesting information about habits, &c., he concludes the book with chapters on the collection and preservation of insects, museum collections and types, publications dealing with Australian entomology, and an alphabetical index of Latin and English names.